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## Digital workplace: digital transformation for environmental sustainability

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# Digital workplace: digital transformation for environmental sustainability

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**Abstract.** Environmental Sustainability becomes a major issue around the world. Energy consumption and air pollution are some important issues that have been discussed among scholars and practitioners. The purpose of this paper is to examine how digital workplace implementation could contribute to empower environmental sustainability, why this is important and how this can be achieved. We collected the data from UIN Sunan Ampel Surabaya and do the simulation if their employees implement the digital workplace for three cases, 50% of the farthest employees, 50% of the nearest employees, and 50% on random. The efficiency of fuel used obtain was 44.39%, 5.61%, and 22.2% respectively. From the simulation, it can be concluded that the application of the digital workplace can be an alternative in the framework of global environmental sustainability.

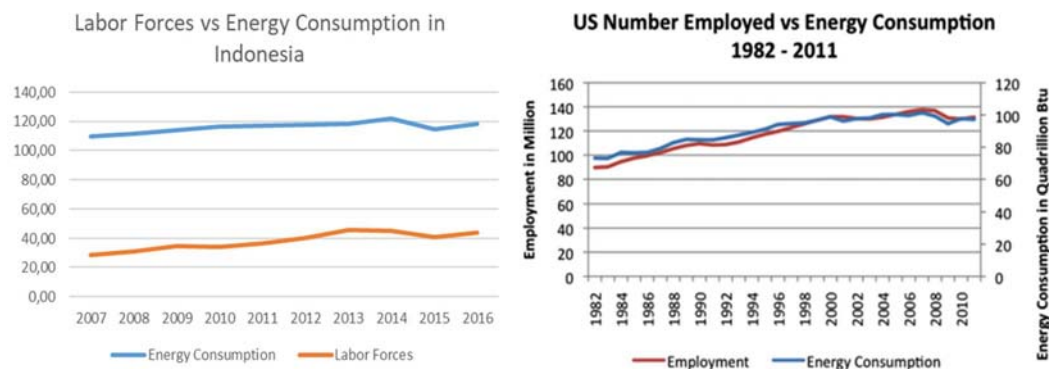
## 1. Introduction

Environmental Sustainability is a global consent. Sustainability consists of three pillars which are the environment, the economic, and social sustainability. Environmental sustainability emphasizes the environmental life support system that should be maintained [1]. One serious issue in an environment is energy consumption. Energy consumption is increasing significantly over the year.

Figure 1 shows a strong relationship between Labor forces and Energy Consumption in Indonesia from the year 2007 to 2017. This relationship possibly was caused by geographical dispersion among employees. The high price of living costs in the urban led them to live in the countryside. Therefore, in order to be able to go to the office, they usually commute in a long period of time whether using private or public transportation. This phenomenon happens all around the work, previous research conducted survey among European countries found that every sixth teleworker against every 27<sup>th</sup> non-teleworker had a commuting distance of more than 50 kilometers [2].

Indonesia is currently listed as the 7th most populous country in the world [3]. United Nation also said that more than half the increase in the global population by 2050 will be concentrated in nine countries, including Indonesia. In 2015 the population of productive age (15-64 years) in Indonesia reached 68% of the Indonesian population. Although this proportion is predicted to decrease in number to 65-66% by 2045, the number will continue to increase rapidly due to the increasing population [4]. As is known, productive age is the active age of work, and efforts to go home from work certainly use energy as previously discussed. So our country must start thinking seriously about the energy efficiency of workers. This study raises the concept of a digital workplace with the expectation of reducing the energy consumption of workers in Indonesia. With the reduction in energy consumption in our country, it is expected to contribute to preserving the environment on a global scale.





**Figure 1.** Energy Consumption VS Labor Forces.

## 2. Literature review

### 2.1. Digital Workplace

There are 3 major differences from traditional workplace and modern workplace: Time, Place, and device. In the traditional workplace, most of the work happens in the office at working hours, using Personal Computer (PC) and/or telephone. In *Telework*, most of the work happens at employees' own home which uses more personal devices at home. In the *mobile workplace*, the concept of the time it's still the same, flexible but place to do the work more varied, it could happen at home, cafe, train, station, and other places. The device that is used more varied such as smartphones and laptops. In *Virtual Workplace*, the location of the workplace is more flexible, it could happen anywhere and anytime such as in the lift, parking lot, or other places due to modern device that is smaller, more affordable and offer more flexibility and mobility. These different types of workplace described as three-wave of a workplace [5]. The most scholar also called it a Digital Workplace.

These modern workplaces disengage employees from the physical attribute of the traditional workplace. They offer flexibility in the matter of time and space. The employee could work anywhere and anytime without ignoring the collaboration and communication from other colleagues. Previous research shows that the rise of the digital workplace has so many impacts for employees from health issues [6], work-life balanced [7], workforces satisfaction [8], and performance [9].

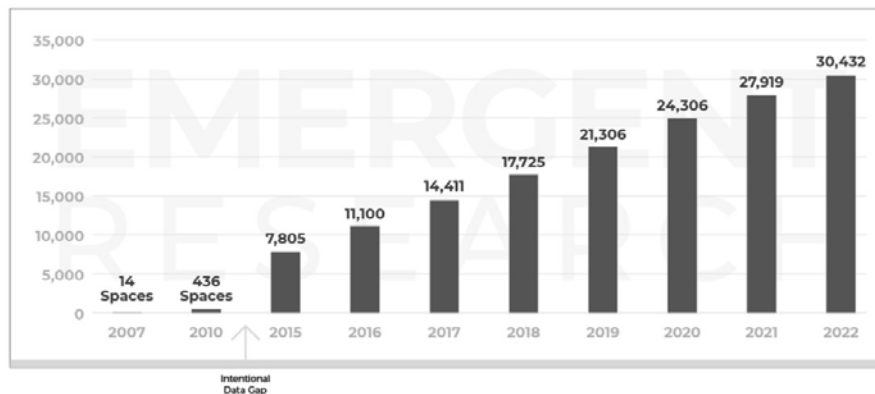
### 2.2. Co-working Space

The concept of modern workplace caused the rise of co-working space for public use. Co-working spaces are a place that can be used by some people with different backgrounds and professions to work or study [10]. The number of co-working spaces increases significantly over time. The co-working space projected will keep increasing every year (Figure 2).

The fact that Co-working spaces increasing over time shows the global transformation in the workplace. There are several factors that caused the increasing number of co-working spaces around the world:

1. Advance development of ICT enables the worker to disengage from a specific place to work. The Internet enables them to work in different places every day.
2. The increasing number of population and employment around the world while renting price of a building(property) increase rapidly.
3. The rise of start-up and creative business which has technology as their backbone of business model which doesn't require the employee to work at office hour.
4. Bargaining power of the workforces. The survey shows that employees willing to be paid lower as long as the company gives flexibility in a matter of time ("The Cisco Connected World Report". Cisco Systems. October 2010. Presentation)

The development of ICT is the main factor that supports all 4 factors mentioned above. Internet and advanced networks have enabled people to connect globally without any limitation in time and space.



**Figure 2.** Global Number of co-working spaces projected around the world.

### 2.3. Green Computing

The basic concept of green computing began in 1991 when the Environmental Protection Agency (EPA) introduced the "Green Light" program. Then in 1992, the "Energy Star" program followed the same concept with the Energy Star label [11]. The definition of green computing is: how to use computers that are environmentally responsible by reducing energy consumption and minimizing waste to the environment [12]. Formal approaches to green computing consist of [13]:

- Green design
- Green manufacturing
- Green management
- Green purchasing
- Green use
- Green recycling and disposal

In the document, Raza et al said that for Green Manufacturing indeed focused on the Development of Green Products, but it was time to think of alternative concepts in the form of Virtual Green Manufacturing and Simulation and Optimization of Virtual Enterprise [13]. The virtual purpose in the concept is nothing but certainly to maximize the efficiency of the production process.

The concept of efficiency in all ICT related fields in the information system study program at UIN Sunan Ampel Surabaya is referred to as Islamic Green Computing [14]. In the concept of Islamic green computing. As a Muslim, it is proper to do efficiency for the sake of the preservation of the earth, because it is in accordance with the Sunnah of the Prophet. Included in the ICT support devices include air conditioning (AC). It is undeniable that almost all offices currently use air-conditioning devices to support a productive atmosphere. With reduced office hours, the use of air conditioners will also save even more.

In addition to the concept of Islamic green computing that was discussed at the UINSA Information Systems study program, several researchers who had previously discussed the relationship of green computing with Islamic teachings included:

- Strategy and Policy Statements on Green ICT and Islamic Perspectives in 2011 [15]
- Ethical Issues in Computer use A Study from Islamic Perspective 2013 [16]
- A Review of the Affair of the Qur'an and Green Computing in 2017 [17]

### 3. Methods

In order to attain the conclusion, we collect the data from the human resource information system in UIN Sunan Ampel Surabaya. The number of data collected is 852 data from 886 active employees. The data collected was the location of their home addresses. In the next step, we estimate the distance from UIN Sunan Ampel Surabaya using Google Maps®. After that, we simulate the energy consumed by them in fuel and estimate the saved energy if the digital workplace being implemented. We also conduct a further investigation by doing observation at UIN Sunan Ampel Surabaya to get additional information about the energy that they would be saved if the digital workplace has been implemented.

### 4. Results and discussion

From the data, there are 529 employees live outside Surabaya (the location of their office). It means only 37% of employees who live in the same city as their office. However, since the location of UIN Sunan Ampel Surabaya is not far from Sidoarjo, there are 304 employees live there. We calculated the energy consumed by the employees. Before it was simulated, we made several assumptions:

- 1) All employees using standard motorcycle which consumed 1lt/30000 meters.
- 2) The fuel consumed was Petralite (Rp 7.650/lt).
- 3) The number of effective days a month is 20 days.

Table 1 describes the comparison of money saved if 50% of employees work from home for 10 days only. From the data, we could say that the implementation of the digital workplace has a significant impact on energy saving. The total estimated distance for all employees was 28.117 Km, the total of fuels used in a month was 37.489,33 lt. It means the total money used Rp. 286.793.400.

**Table 1.** Simulation Summary.

Note	Total of Estimate Distance (km)	Total of Fuels used a month (lt)	Total of Money used (Rp)	Saving Estimation
50% farthest distance	249,643,050	16,642.87	127,317,955.50	<b>44.39%</b>
50% nearest distance	31,527,000	2,101.80	16,078,770.00	<b>5.61%</b>
50% random	124,840,050	8,322.67	63,668,425.50	<b>22.20%</b>

#### 4.1. Impact of Digital Workplace on Environment

Environmental sustainability becomes one major issue around the world and appears in many research disciplines.

*4.1.1. Commute-less.* Geographical dispersion among the workforces is one of the difficulties of the employee to work at their office. The high price of housing in the metropolitan area compels them to choose to live in the non-urban area or countryside. This fact could lead to a high travel rate for the employees in order to be able to work every working day. In the digital workplace, the employee could reduce their travel needs by accessing the company's system remotely. This fact could lead to less use of energy consumption on transportation [18].

However, for some people, working at home is not comfortable. The increasing number of co-working spaces enable the employee to work to the nearest places to their home. It could have a direct impact on the environment since they don't have to waste time and money to travel to the office. The direct impact of the digital workplace on energy consumption has been proven empirically [18]. The other positive impact is traffic congestion. Traffic jam happens every working day early in the morning and late afternoon (time for the employee to get off to/from office). The concept of the Digital Workplace arranges working hours into different characteristics of every employee and can cause the reduction of traffic congestion at that time.

*4.1.2. Paper-less.* The increase used of paper could harm the environment is undebatable. Paper is made from wood that led to deforesting. Moreover, paper making processes usually used as a chemical

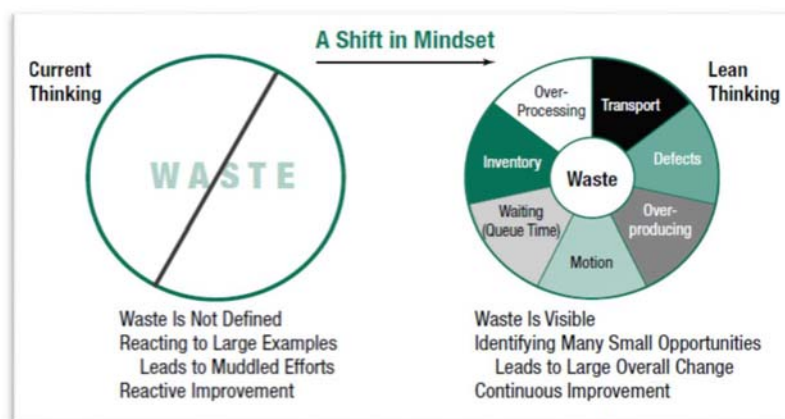
compound that is not environmental friendly [19]. Scholars and scientist trying to formulate more sustainable processes on papermaking manufacture [20,21]. It needs awareness and cooperation from industries and government in order to implement it.

The development of a personal device that is smaller and lighter could also change the way people use paper. For examples of reading activity, there are some people who still comfortable with paper when they read something, but most people now likely to used their personal devices to read. The reason was simply that it is easier to search the digital document rather than looking for it in the drawer or in another place that they could remember they put it. Moreover, most of them think they tend to use cloud storage rather than their own physical hard drive due to its flexibility and accessibility from anywhere and any device. This behavior could lead to a paperless lifestyle which has a very significant impact on the environment.

In addition, instead of using the traditional signature to authenticate the document, the digital signature has to be used. This policy should be addressed by the organization. It could reduce paper used significantly. However, security and privacy should be realized, previous research elaborate on the aspect that the organization should be aware [22]. The strategy to build a paperless culture in the office also elaborates on previous research [23]. It said that good environmental practice and legislation need to be addressed.

Therefore, the paperless lifestyle should be adopted by the employee in the era of the digital workplace. The organization should have a clear understanding and develop a specific policy regarding this issue.

**4.1.3. Waste-less.** Waste is anything that adds cost or time without adding value. The lean management office is the concept that emphasizes the office minimalized waste and maximal flows to increase awareness of what actually constitutes waste and working to eliminate it [24]. The successful lean management office needs a full commitment and cooperation of all work on a daily basis. A shift mindset shown at Figure 3.



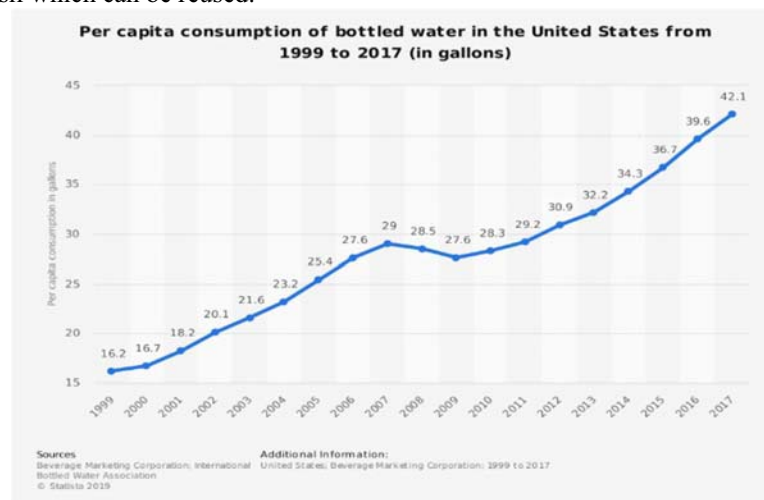
**Figure 3.** Shift Mindset of Waste [24].

#### *a. Calendar*

What happens to the old Calendar? Most of the traditional office has so many calendars on their building, even on every single desk. This calendar would be wasted right after the year-end. This behavior in the digital workplace should be eliminated. There is so many online Calendar that has an advanced feature from a to-do list, event management, and we can easily share our agenda with other people.

#### b. Lunch Box & Bottle Water

Re-use packaging is much more environment-friendly. However, there are so many employees still used paper or plastic to package their lunch boxes. Figure 4 shows the number of bottle water used in the USA and shows that it increases considerably. They just feel it's more simple since they can easily throw it to the trash and lead to so much wasted in the office. If employees work at homes they tend to use their own utensil which can be reused.



**Figure 4.** Bottle Consumption.

On the other hand, ICT development also has challenges in waste management. People tend to get a newer device that has advanced technology and new features. User behavior on using the newer device that is actually not a basic need caused enormous e-waste. It could create electronic waste (E-waste). E-waste management needs further legislation and practice regarding the process of collecting, recycling, and transporting in order to maintain sustainability [25].

Table 2 summarizes the impact of Digital Workplace implementation on the organization. Three major impacts are commute less, paperless, and waste less.

**Table 2.** Digital Workplace Impact.

Commute less	Paperless	Waste less
Working at home	Using pdf instead of paper	Using re-use utensil
Working at the nearest co-working spaces	Using Digital Signature	Minimum use of Air Conditioner, water, and electricity

#### 4.2. Challenge and Strategy

Digital Workplace implementation could also create challenges both for employees and the organization. Table 3 summarizes the challenge and elaborates on the strategy that could be adopted by the organization.

**Table 3.** Challenge and Strategy.

Challenge	Strategy
Jobs Precarity [26]	Human Resource Department has to develop a new form of work contract contained the right and obligation of the employees with mutual advantage for both employees and the organization.  Objective performance monitoring using an information system to provide employees with a promotion mechanism.
Workaholic Phenomena (hard to disengage with work)	Disengagement strategy to work, this can be done using a specific information system that can control working hour of employees.
Social relationship problem	Regular meeting once a month could help the employee to maintain relationship and physical attachment to other employees
Health Issues	The health monitoring system needs to be addressed and the alternative working environment should have a good quality of air and pollution-free.

## 5. Conclusion

From the results of the discussion, it can be concluded that the impacts of implementing the digital workplace concept are: Commute-less, Paper-less, and Waste-less. With these three savings, surely budget efficiency can be achieved. Also in terms of efficiency in transportation costs. From the simulation, it was found that the efficiency of employee fuel usage for commuting to and from work can be achieved with the concept of a digital workplace. If the digital workplace is implemented on half the employees taken at random, an efficiency of 22.20% is obtained. Whereas for half of the closest employees 5.61%. And for half of the employees whose distance is farthest at 44.39%. With the figures generated it can be concluded that the application of the digital workplace can be an alternative in the framework of global environmental sustainability.

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